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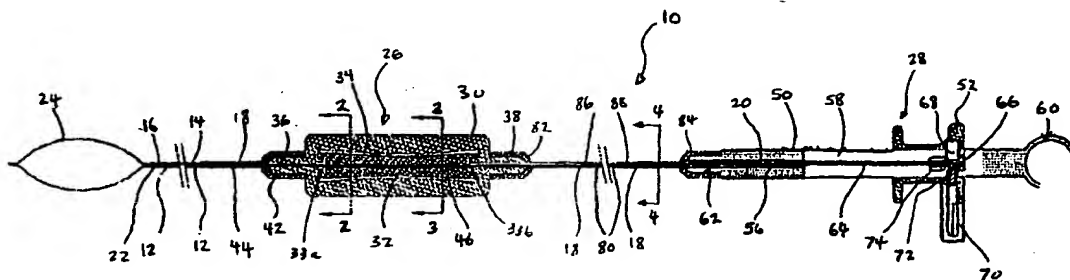
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- (71) Applicant: **BOSTON SCIENTIFIC CORPORATION**  
[US/US]; One Boston Scientific Place, Natick, MA 01760-1537 (US).
- (72) Inventor: **SMITH, Kevin, W.**; 570 Arvida Parkway, Coral Gables, FL (US).
- (74) Agents: **LYNCH, John, E.** et al.; Fulbright & Jaworski, LLP, Washington, DC 20004-2615 (US).
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(54) Title: **POLYPECTOMY SNARE INSTRUMENT**



(57) **Abstract:** A surgical snare instrument includes a first handle (26) capable of controlling the rotational position of the snare (24), and a second handle (28) adapted to control the opening and closing of the snare (24) and cauterization. The first handle (26) serves as a grippable element on the sheath (12) and contains a system which rotates the shaft (18), and consequently the snare (24), so that when the physician grips the first handle (26), the physician is capable of steering the snare (24) by operating the first handle (26). In addition, the physician is also capable of positioning the entire sheath (12) relative to the endoscope by sliding the sheath (12) into and out of the working channel of the endoscope.

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POLYPECTOMY SNARE INSTRUMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates broadly to surgical instruments. More particularly, this invention relates to a surgical snare instrument for excising polyps.

2. State of the Art

Polypectomy snare instruments are used for the endoscopic removal of hypertrophic tissue growths within a body cavity, and particularly within the colon. Polypectomy snare instruments generally include an elongate tubular member, such as a catheter sheath, a shaft extending through the tubular member, an elastic wire forming a snare (loop) at the distal end of the shaft, and a handle for moving the shaft distally and proximally within the tubular member. The snare can be opened by moving the snare beyond the distal end of the sheath and closed by retraction of the snare into the tubular member, each effected by movement of the shaft relative to the sheath.

In operation, a physician introduces the distal end of the instrument, with the snare of the snare instrument in a retracted position, through the working channel of an endoscope until the

1 sheath begins to extend out of the distal end of the endoscope.  
2 The physician then directs an assistant, who has control of the  
3 handle of the snare instrument, to open the snare. The assistant  
4 accomplishes this function by moving two portions of the handle  
5 relative to each other. The physician then advances and retracts  
6 the sheath into and out of the endoscope, while applying torque to  
7 some portion of the instrument to position the snare loop over and  
8 around a polyp. Once the snare loop is positioned around the  
9 polyp, the physician orders the assistant to close the snare  
10 around the polyp. Then, the physician or assistant energizes a  
11 source of electrocautery current coupled to the shaft to  
12 desiccate, sever, and cauterize the polyp. Finally, the polyp is  
13 removed by withdrawing the snare (or, in some cases, the polyp is  
14 retrieved by use of another instrument such as a biopsy forceps).  
15 In a variation of the procedure, the physician uses suction  
16 applied to a channel of the endoscope to remove the polyp or to  
17 hold it to the end of the endoscope.

18

19 Prior art snare instruments have several problems. First, it  
20 is difficult for the physician to precisely position the snare  
21 because the physician relies on gripping the small, slippery  
22 sheath over the shaft near where the sheath enters the endoscope  
23 handle. Typically, it is necessary for the physician to  
24 repeatedly push, pull, and torque the sheath and the shaft of the  
25 instrument in order to achieve the desired position with the snare

1 around the polyp. Second, the prior art instruments are not  
2 capable of efficient steering, because the shaft which is  
3 generally used is a cable having low torsional stiffness, and is  
4 not usually free of camber or "set". The result of these defects  
5 is that when the instrument is used in a tightly-flexed endoscope,  
6 the distal end of the snare does not respond directly to torsional  
7 input on the shaft where it enters the endoscope handle; i.e.,  
8 rather than directly respond to torsional input from the  
9 physician, the shaft stores the torsional force and upon reaching  
10 a threshold, uncontrollable rotationally whips to release the  
11 force. Third, while several attempts have been made at providing  
12 a snare instrument with a handle adapted to more adeptly steer the  
13 snare, most of such prior art instruments do not specifically  
14 allow for rotating the snare to position it relative to the polyp.  
15 Rather, the physician must rotate the shaft of the instrument by  
16 tightly gripping and rotating the sheath where it enters the  
17 endoscope to try to maneuver the snare over the polyp. In  
18 addition, in the several prior art devices specifically adapted  
19 for rotational control, e.g., U.S. Patent No. 5,066,295 to Kozak  
20 et al. and U.S. Patent Nos. 3,955,587, 4,256,113, and 4,294,254 to  
21 Chamness et al., the rotational control function is placed in the  
22 handle at the proximal end of the instrument. This handle then  
23 controls the extension and retraction of the snare loop as well as  
24 the rotation of the snare loop. However, this handle is typically  
25 held by the assistant, so the physician must orally direct the

1 assistant to coordinate the handle controls while the physician  
2 moves the jacket in and out of the endoscope. As a result, these  
3 instruments have not been widely accepted by physicians.  
4

5 SUMMARY OF THE INVENTION  
6

7 It is therefore an object of the invention to provide a snare  
8 instrument which permits the physician to control all aspects of  
9 positioning the snare loop relative to the polyp, while allowing  
10 the assistant to perform the cauterizing and severing of the  
11 polyp.  
12

13 It is a further object of the invention to provide a snare  
14 instrument which provides to the physician the means for advancing  
15 and retracting the distal end of the snare instrument through the  
16 endoscope, as well as rotating the snare, and which provides to  
17 the assistant the means for extending and retracting the snare  
18 loop from the sheath of the snare instrument.  
19

20 It is another object of the invention to provide a snare  
21 instrument in which the physician has direct and immediate control  
22 of the entire instrument.  
23

1       It is also an object of the invention to provide a snare  
2 instrument which obviates the need for an assistant during a  
3 polypectomy procedure.

4  
5       It is yet another object of the invention to provide a snare  
6 instrument which improves the speed and efficiency of a  
7 polypectomy procedure.

8  
9       In accord with these objects, which will be discussed in  
10 detail below, a surgical snare instrument is provided. The snare  
11 instrument includes an elongate flexible tubular sheath, a  
12 flexible shaft extending through and axially movable relative to  
13 the sheath, a snare coupled to or formed at the distal end of the  
14 shaft, and a system to move the shaft, and consequently the snare,  
15 relative to the sheath. According to several embodiments of the  
16 invention, the system for moving the shaft relative to the sheath  
17 includes a first (physician's) handle capable of controlling the  
18 position of the snare, and a second (assistant's) handle proximal  
19 the first handle and adapted to control contraction of the snare  
20 and cauterization. The handles are coupled by a tubular sheath  
21 extension.

22  
23       The physician's handle is preferably positioned along the  
24 sheath of the snare instrument so that it is a few inches proximal  
25 to the entry port of the endoscope handle when the distal end of

1 the sheath is adjacent to the distal end of an endoscope. The  
2 physician's handle serves as a grippable element on the sheath and  
3 contains a rotating means for rotating the shaft, so that when the  
4 physician grips that handle the physician is capable of steering  
5 (rotating) the snare by operating the rotating means. In  
6 addition, the physician is also capable of positioning the entire  
7 sheath relative to the endoscope by sliding the sheath into and  
8 out of the working channel of the endoscope. The proximal handle  
9 is operable by an assistant and permits longitudinal movement of  
10 the shaft and snare and the application of a cautery current to  
11 the shaft and snare.

12

13 According to other embodiments, the snare instrument is  
14 provided with a connector which enables the snare instrument to be  
15 fixed relative to an endoscope handle. Additionally, an  
16 embodiment is also provided in which a single handle provides a  
17 physician with means for advancing and retracting the sheath of  
18 the snare instrument relative to the distal end of the endoscope,  
19 means for advancing (opening) and retracting (closing) the snare  
20 relative to the distal end of the sheath, and means for steering  
21 (rotating) the snare to position the snare over a polyp. Since  
22 the physician has direct and immediate control of the entire  
23 instrument, the snare instrument obviates the need for an  
24 assistant during the procedure, and improves the speed and  
25 efficiency of the polypectomy procedure.

1 Additional objects and advantages of the invention will  
2 become apparent to those skilled in the art upon reference to the  
3 detailed description taken in conjunction with the provided  
4 figures.

5  
6 BRIEF DESCRIPTION OF THE DRAWINGS

7  
8 Fig. 1 is broken side elevation in section of a first  
9 embodiment of a snare instrument according to the invention;

10  
11 Fig. 2 is an enlarged cross-section taken through line 2-2 in  
12 Fig. 1;

13  
14 Fig. 3 is an enlarged cross-section taken through line 3-3 in  
15 Fig. 1;

16  
17 Fig. 4 is an enlarged cross-section taken through line 4-4 in  
18 Fig. 1;

19  
20 Fig. 5 is a broken section view of a physician's handle  
21 assembly according to a second embodiment of the snare instrument  
22 of the invention;

23  
24 Fig. 6 is an enlarged cross-section through line 6-6 in  
25 Fig. 5, showing the engagement of a key in a knob shaft;



1        Fig. 7 is an enlarged cross-section through line 7-7 in  
2        Fig. 5, at a location proximal of the key;

3  
4        Fig. 8 is a broken section view of a third embodiment of the  
5        snare instrument according to the invention;

6  
7        Fig. 9 is an enlargement of the area between lines 9a-9a and  
8        9b-9b in Fig. 8;

9  
10       Fig. 10 is a broken section view of a fourth embodiment of  
11       the snare instrument of the invention; and

12  
13       Fig. 11 is a broken section view of a fifth embodiment of the  
14       snare instrument of the invention.

15  
16       DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

17  
18       Turning now to Fig. 1, a first embodiment of a surgical snare  
19       instrument 10 according to the invention is shown. The snare  
20       instrument 10 includes an elongate flexible tubular sheath 12  
21       having a proximal end 14 and a distal end 16, a flexible shaft 18  
22       having a proximal end 20 and a distal end 22 extending through and  
23       axially movable relative to the sheath 12, a snare 24 coupled to  
24       or formed at the distal end 22 of the shaft 18, preferably  
25       adjacent the distal end 16 of the sheath 12, and first and second

1 handle assemblies 26, 28, respectively, for moving the shaft 18  
2 relative to the sheath 12.

3

4 The shaft 18 is preferably a high strength, straightened  
5 (camber-free) stainless steel wire of high elastic limit. The  
6 shaft 18 is adapted to be bent through a tortuous path without  
7 permanent deformation. In addition, since the shaft 18 is free of  
8 camber, it is possible to precisely rotate the snare 24 by  
9 rotating the shaft at any point along its length.

10

11 Referring now to Figs. 1 through 3, the physician's handle  
12 assembly 26, which is the more distal of the two handles,  
13 generally includes a body 30 and a knob 32 mounted in the body 30  
14 on bearings 33a, 33b in a manner which permits the knob 32 to  
15 rotate coaxially relative to the body. The body 30 includes a  
16 central bore 34 with one or more apertures 35, a threaded distal  
17 end 36, and a threaded proximal end 38. The sheath 12 of the  
18 snare instrument 10 is connected to the threaded distal end 36 of  
19 the body 32, e.g., by means of a flare-nut connection 42.  
20 Preferably, a stiffening sleeve 44 is provided over the sheath 12  
21 at the connection 42. The knob 32 includes a non-circular bore  
22 40, e.g., having the cross-sectional shape of a square. The knob  
23 32 (for reasons discussed below) is preferably at least as long as  
24 the distance of movement required to open and close the snare 24;  
25 i.e., the length of the snare when compressed in the sheath 12.

1 The apertures 35 provide access to the knob 32, so that the knob  
2 32 can be rotated relative to the body 30, e.g., by a physician.

3  
4 A portion of the shaft 18 extending through the bore 40 of  
5 the knob 32 is provided with a key 46; that is, a spline element  
6 fixed on and about the shaft 18 or, alternatively, rigidly and  
7 fixedly interposed between two portions of the shaft. The key 46  
8 preferably has a rectangular shape but may have another non-  
9 circular shape. The key 46 is slidably axially movable within the  
10 bore 40. Therefore, the shaft 12 may be moved axially through the  
11 bore 40 (and that is why the length of the knob 32 is preferably  
12 at least as long as the distance of movement required to open and  
13 close the snare). However, when the knob 32 is rotated relative  
14 to the body 30, the key 46 within the bore 40 is rotated and,  
15 consequently, the shaft 18 and snare 24 are rotated relative to  
16 the sheath 12.

17  
18 The distal handle assembly 28 is preferably positioned  
19 approximately 210 cm from the distal end 16 of the sheath 12 for a  
20 snare instrument 10 designed to be inserted into a 200 cm  
21 endoscope. Thus, the physician can grip the body 30 in a manner  
22 which permits rotating the knob 32 relative to the body, and hence  
23 the snare 24 relative to the sheath 12, while using the body 30 as  
24 a grip to axially position the snare instrument 10 within the  
25 working channel of an endoscope.

1       The shaft 18 extends out of the proximal end 38 of the body  
2 30 to the proximal handle assembly 28, or assistant handle. The  
3 proximal handle assembly 28 preferably includes a stationary  
4 member 50 and a spool member 52 slidable relative to the  
5 stationary member. The stationary member 50 includes a  
6 longitudinal throughbore 56 through which the proximal end 20 of  
7 the shaft 18 extends, a transverse slot 58, a proximal thumb ring  
8 60, and a distal threaded connector 62. The proximal end of the  
9 shaft 18 is preferably provided with a conductive stiffening  
10 sleeve 64, and a cylindrical conductive bearing 66 is coupled  
11 about the proximal end of the stiffening sleeve 64. The spool  
12 member 62 includes a cross bar 68 which extends through the  
13 transverse slot 58 to secure the spool member 52 on the stationary  
14 member 50. In addition, the spool member 62 preferably includes a  
15 cautery plug 70. The conductive bearing 66 extends through the  
16 cross bar 68 and a collar 74 secures the bearing 66 in the cross  
17 bar 68 in a manner which permits the conductive bearing to freely  
18 rotate within the cross bar 68. A spring 72 extends between the  
19 cautery plug 70 and the conductive bearing 66, and provides a  
20 contact between the plug 70 and the bearing 66 regardless of the  
21 rotational position of the bearing 66. Movement of the spool  
22 member 52 relative to the stationary member 50 causes the snare 24  
23 to extend from and retract into the distal end 16 of the sheath  
24 12.

25

1 Referring to Figs. 1 and 4, an electrically insulative  
2 extension sheath 80 extends over the shaft 18 between the proximal  
3 end 38 of the body 30 and the distal end 62 of the stationary  
4 member 50, coupled, e.g., via flare-nut connections 82, 84. Thus,  
5 there is a continuous outer connection joining, yet spacing apart,  
6 the distal handle assembly 26 and the proximal handle assembly 28.  
7 A stiffening sleeve 86 is preferably provided over the extension  
8 sheath 80 at the proximal end 38 of the body 30, and another  
9 stiffening sleeve 88 is preferably provided over the extension  
10 sheath 80 at the distal end 62 of the stationary member 50.

11

12 In use, the physician introduces the snare instrument 10 into  
13 the endoscope (not shown), typically by means of a port in the  
14 endoscope handle which communicates with the working channel of  
15 the endoscope. Then, the physician gives the proximal assistant's  
16 handle 28 to the assistant. The physician then grips the body 30  
17 of the distal physician's handle 26 of the snare instrument and  
18 uses it to position the distal end 16 of the sheath 12 adjacent to  
19 the polyp to be excised. The physician then instructs the  
20 assistant to extend the snare, which is performed by moving the  
21 spool member 52 relative to the stationary member 50. The  
22 physician then uses the distal handle 26 to simultaneously axially  
23 position and rotate the snare over the polyp. Then, the physician  
24 instructs the assistant to close the snare and sever the polyp,  
25 using cautery if desired. In this manner, the physician controls

1 the means of positioning the snare onto the polyp, and the  
2 assistant controls the opening and closing of the snare and the  
3 cauterization.

4  
5 In the first embodiment, as discussed above, it will be  
6 appreciated that the knob 32 is preferably at least as long as the  
7 distance of movement needed to open and close the snare 24.  
8 However, turning now to Figs. 5-7, according to a second  
9 embodiment of a snare instrument 110, the key 146 on the shaft 118  
10 is made sufficiently small in diameter such that it can pass  
11 partly into the bearings 190, 191 on the body 130 (which support  
12 the knob 132) and proximal and distal ends 136, 138 of the body  
13 130, or even into the sheath 112 and extension sheath 180, and  
14 their respective stiffening sleeves. Accordingly, the knob 132 is  
15 provided with a hollow knob shaft 192 having a non-circular bore  
16 140 which rotatably engages the key 146 on the instrument shaft  
17 118. The knob shaft 192 extends beyond the proximal and distal  
18 ends of the knob 132. The knob shaft 192 extends into bearings  
19 190, 191 of the body 130 which allows the knob 132 and knob shaft  
20 192 to spin within the body 130. The knob shaft 192 may  
21 optionally extend through the proximal and distal ends 136, 138 of  
22 the body 130, into the sheath (on the distal end) and into the  
23 extension sheath (on the proximal end). In this manner, it is  
24 possible to achieve a large range of axial motion (e.g., 3.5  
25 inches) while having a knob 132 of much shorter dimension (e.g.,

1 1.25 inches). It should be noted that if the key 146 has a  
2 substantial length (e.g., 0.75 inch), the body 130 and knob 132  
3 can be made even shorter, since it is necessary for only a portion  
4 of the key 146 to be engaged with the non-circular bore 140 of the  
5 knob shaft 192 at any time.

6  
7 In addition, while the first embodiment describes a shaft 18  
8 that is monolithic and continuous from the snare 24 to the  
9 proximal handle assembly 28, the shaft may alternatively be a  
10 composite structure. Specifically, referring to Figs. 8 and 9,  
11 according to a third embodiment of the invention, the  
12 straightened, torsionally-stiff, camber-free section of the shaft  
13 218 need only extend from the snare to the knob 232. A swivel  
14 joint 290 may be interposed on the shaft 218 between the knob 232  
15 and the proximal handle assembly, and join the shaft 218 to a  
16 flexible or stiff proximal shaft extension 292 which extends to  
17 the proximal handle assembly. The proximal end 294 of the shaft  
18 218 is preferably formed into an enlarged section, i.e., a head  
19 296, or a separate, enlarged head may be attached to the proximal  
20 end of the shaft. A swivel tube 298, preferably made of a  
21 malleable alloy, such as brass or stainless steel, is provided  
22 over the head 296. A distal end 299 of the swivel tube 298 is  
23 swaged or crimped to form a loose fit on the shaft 218, while  
24 being small enough to retain the head 296. The swivel tube 298 is  
25 placed onto the shaft 218 such that the head 296 is trapped inside

1 the non-crimped portion 300 of the swivel tube 298. The extension  
2 shaft 292 is pushed into the proximal open end 304 of the swivel  
3 tube 298, and the swivel tube 298 is firmly crimped onto the  
4 extension shaft 292. The extension shaft 292 is preferably made  
5 of either a flexible cable, for example, a 1x7 stranded stainless  
6 steel cable preferably of 0.032 inch diameter, or a solid wire of  
7 a springy material such as stainless steel, for example, a 0.020  
8 inch diameter 304 stainless steel spring-temper wire. The  
9 extension shaft 292 extends proximally from the swivel tube 298 to  
10 the spool so that it transmits reciprocating longitudinal motion  
11 of the spool through the swivel tube 298 to the shaft 218.

12  
13 This variation in construction of the extension shaft 292 is  
14 allowed because the purpose of the extension of the shaft 218 is  
15 merely to transmit the reciprocating axial motion imparted by the  
16 proximal handle; thus, if there exists a freely rotational joint  
17 between distal shaft 218 and the extension shaft 292, there is no  
18 requirement for the extension shaft to be straight,  
19 torsionally-stiff, or camber-free.

20  
21 Turning now to Fig. 10, according to a fourth embodiment of  
22 the invention, the distal handle assembly 326 includes a mount 350  
23 capable of firmly coupling the distal handle assembly 326 to a  
24 port in an endoscope handle (not shown), for example, by  
25 interference fit. In a preferred configuration, the mount 350



1 includes a coupling fitting 352 which is couplable to the port of  
2 the endoscope, and a connector 354 which is slidably movable, yet  
3 capable of being secured in a position, relative to the coupling  
4 fitting 352. The connector 354 has a proximal end 356 which is  
5 threadably coupled to the distal end 336 of the body 330.

6

7 The coupling fitting 352 includes a cylindrical block 358  
8 having an axial bore 360, and a tubular nosepiece 362 secured in  
9 the axial bore 360. The connector 354 includes a stepped bore 364  
10 having a relatively large central portion 366, and relatively  
11 smaller proximal and distal portions 368, 370. The central  
12 portion 366 of the stepped bore 364 is sized to permit relative  
13 axial movement over the block 358. The distal portion 370 of  
14 stepped bore 364 is sufficiently large to permit axial movement of  
15 the connector 354 over the nosepiece 362. A locking screw 372  
16 extends radially into the central portion 366 of the stepped bore  
17 364 of the connector 354 such that the screw 372 may be rotated to  
18 tighten against the block 358 to lock the connector 354 axially  
19 relative to the block. The proximal end 314 of the sheath 312  
20 extends through the nosepiece 362 and block 358 and is fixedly  
21 coupled in the proximal portion 368 of the stepped bore 364.  
22 Other aspects of the fourth embodiment are substantially as  
23 described above with respect to the first embodiment.

24

1        In use, the snare instrument is inserted through a port of an  
2 endoscope until the nosepiece 362 of the snare instrument is  
3 stably inserted in the port. The distal end of the sheath of the  
4 snare instrument may then be adjustably fixed relative the distal  
5 end of the endoscope by adjusting the connector 354 (and hence the  
6 handle 326, shaft 318, and sheath 312) over the block 358. When  
7 the sheath is correctly positioned, screw 372 may be set. The  
8 distal handle 326 may then be operated, as described with respect  
9 to the first embodiment, to rotate the shaft 318 and snare  
10 relative to the sheath 312. Likewise, a proximal handle assembly,  
11 as described with respect to the first embodiment, may then be  
12 manipulated to longitudinally move the shaft 318 to open and close  
13 the snare (the sheath having been previously set in position).  
14 With the above described embodiment, it may be possible for the  
15 physician to operate without an assistant as the axial placement  
16 of the snare instrument is established and set prior to rotation  
17 and activation of the snare loop.

18  
19        Referring now to Fig. 11, according to a fifth embodiment of  
20 the invention, a single handle assembly 427 capable of being fixed  
21 relative to an endoscope handle is provided. The handle assembly  
22 427 of the snare instrument includes all of the controls  
23 previously provided in the proximal and distal handle assemblies,  
24 and is substantially similar to the distal handle assembly 326,  
25 described above, with the additional incorporation of the snare

1 opening and closing functions. To that effect, a sliding spool  
2 assembly 428 for longitudinally moving the shaft 418 relative to  
3 the sheath 412 may be substantially rigidly fixed to the proximal  
4 end 438 of the body 430. For example, a distal end 462 of a  
5 stationary member 450 of the spool assembly 428 may be threadably  
6 mated with the proximal end 438 of the body 430. The spool  
7 assembly is preferably otherwise substantially as described with  
8 respect to proximal handle assembly 28 of the first embodiment of  
9 the invention.

10  
11 The resulting device is fixedly couplable relative to an  
12 endoscopic handle and provides to the physician the following  
13 controls: a means for controllably advancing, retracting, and  
14 setting the sheath of the snare instrument relative to the distal  
15 end of the endoscope; a means for advancing (opening) and  
16 retracting (closing) the snare relative to the distal end of the  
17 sheath; and a means for steering (rotating) the snare to position  
18 the snare over a polyp. Since the physician has direct and  
19 immediate control of the entire instrument, the snare instrument  
20 obviates the need for an assistant during the procedure, and  
21 improves the speed and efficiency of the procedure.

22  
23 There have been described and illustrated herein several  
24 embodiments of a surgical snare instrument. While particular  
25 embodiments of the invention have been described, it is not

1 intended that the invention be limited thereto, as it is intended  
2 that the invention be as broad in scope as the art will allow and  
3 that the specification be read likewise. Thus, while the use of a  
4 particular monolithic and composite shafts have been disclosed  
5 with respect to a snare instrument, it will be appreciated that  
6 other flexible shafts may also be provided. Also, while the  
7 cautery connector has been shown on the proximal handle, it will  
8 be appreciated that the cautery connection may be provided in the  
9 physician's handle, or elsewhere along the length of the device,  
10 provided that the cautery connection will not interfere with the  
11 axial longitudinal and rotating motions of the shaft.  
12 Furthermore, while particular shapes and configurations have been  
13 described with respect to the proximal and distal handles, it will  
14 be appreciated that other shapes and configurations may be  
15 provided therefor. As such, it will also be appreciated that  
16 other configurations which provide a gripping handle for the  
17 sheath, means for rotating the shaft, and means for longitudinally  
18 moving the shaft may be used. For example, a control knob which  
19 rotates about an axis perpendicular to the axis of the shaft via a  
20 right-angle drive (using two meshing bevel gears) may be used to  
21 rotate the shaft. The gears may be configured to permit step-up  
22 or step-down rotation, for example, such that rotation of the  
23 shaft rotates the shaft twice as much or one-half as much. In  
24 addition, levers, gears, friction wheels, pulleys, links, etc.,  
25 may be used to longitudinally move the shaft within the sheath,

1 and the snare relative to the distal end of the sheath. Moreover,  
2 while a particular nosepiece has been described for use in the  
3 fourth and fifth embodiment, it will be appreciated that other  
4 nosepieces enabling stable coupling of the snare handle to an  
5 endoscope handle may be used. For example, a threaded connector  
6 capable of threading into or over a port on the endoscope handle  
7 may be used. Also, in the fourth and fifth embodiment, the mount  
8 and the body may be integrally formed or molded, and in the fifth  
9 embodiment, the body and the proximal sliding spool assembly may  
10 be integrally formed or molded. In addition, it will be  
11 appreciated that aspects of the various embodiments may be  
12 combined. For example, but not by way of limitation, the key of  
13 the second embodiment or the swivel joint of the third embodiment  
14 may be used in either of the fourth and fifth embodiments.  
15 Furthermore, the described handle assemblies may be used with  
16 other surgical instruments where both axial and rotational  
17 movement of a control member relative to a tubular member is  
18 required. For example, the handle may be used in laparoscopic and  
19 endoscopic instruments, generally, which include an end effector  
20 other than a snare loop. For example, and not by way of  
21 limitation, end effectors such as baskets and forceps may be used  
22 with the handle. It will therefore be appreciated by those  
23 skilled in the art that yet other modifications could be made to  
24 the provided invention without deviating from its spirit and scope  
25 as claimed.

What is claimed is:

1. A surgical instrument for insertion through an endoscope having a handle and a working channel, said surgical instrument comprising:

a) a elongate flexible tubular sheath having proximal and distal ends;

b) a flexible shaft extending through and axially movable relative to the sheath, said shaft having proximal and distal ends;

c) an end effector coupled to or formed at said distal end of said shaft;

d) a first means coupled to said shaft for rotating said shaft relative to said sheath;

e) a second means for longitudinally moving said shaft relative to said sheath; and

f) a tubular member coupling said first and second means together.

2. A surgical instrument according to claim 1, wherein:  
said end effector is a snare.

3. A surgical instrument according to claim 1, wherein:  
said tubular member is flexible.

4. A surgical instrument according to claim 1, wherein:  
said first means is located distal said second means.
5. A surgical instrument according to claim 1, wherein:  
said tubular member has proximal and distal ends, and  
said first means is a first handle including a first member  
and including a second member provided with a bore, said second  
member being axially rotatable relative to said first member,  
said first member having a distal end fixedly coupled to said  
proximal end of said sheath and a proximal end coupled to said  
distal end of said tubular member,  
said shaft extending through said bore, and said second  
member having means for engaging said shaft such that rotation of  
said second member relative to first member causes rotation of  
said shaft relative to said sheath.
6. A surgical instrument according to claim 5, wherein:  
said shaft includes a key portion provided with a non-  
circular cross section, and said means for engaging said shaft is  
a non-circular cross section of said bore of said second member  
adapted to engage said key portion.

7. A surgical instrument according to claim 6, wherein:

said second member is provided with a tubular portion which extends at least partially into said proximal and distal ends of said first member, said tubular portion having said bore with said non-circular cross section.

8. A surgical instrument according to claim 7, wherein:

said tubular portion of said second member extends beyond said proximal and distal ends of said first member.

9. A surgical instrument according to claim 1,

wherein said second means for longitudinally moving said shaft relative to said sheath includes a first member having a throughbore and a distal end coupled to said proximal end of said tubular member, and a second member coupled to said shaft and movable relative to said first member to cause said shaft to move longitudinally relative to said sheath.

10. A surgical instrument according to claim 9, wherein:

said second member is longitudinally slidable relative to said first member.



11. A surgical instrument according to claim 1, wherein:

said shaft comprises a first element extending from said end effector to a location proximal said first means, and a second element extending from said location to said second member of said second means, said first and second elements being freely axially rotatable relative to each other.

12. A surgical instrument according to claim 11, wherein:

said first and second elements are coupled by a swivel joint.

13. A surgical instrument according to claim 11, wherein

said first element of said shaft is camber-free.

14. A surgical instrument according to claim 1, wherein:

said shaft is freely axially rotatable relative to said second means.

15. A surgical instrument according to claim 14, wherein:

said shaft is camber-free.

16. A surgical instrument according to claim 1, further comprising:

g) a first stiffening sleeve, wherein said sheath is coupled to said first means and said stiffening sleeve is provided over a portion of said sheath at or adjacent a coupling of said sheath to said first means.

17. A surgical instrument according to claim 16, further comprising:

h) a second stiffening sleeve provided over a portion of said tubular member at or adjacent a coupling of said tubular member to said first means.

18. A surgical instrument according to claim 1, further comprising:

g) means for providing a cautery current to said shaft.

19. A surgical instrument according to claim 1, further comprising:

g) mounting means for mounting said first means relative to the handle of the endoscope such that said sheath of said surgical instrument extends through the working channel of the endoscope.

20. A surgical instrument according to claim 18, wherein:

said mounting means is adapted to adjustably fix said distal end of said sheath relative to a distal end of the endoscope.

21. A surgical instrument for insertion through an endoscope having a handle and a working channel, said surgical instrument comprising:

a) a elongate flexible tubular sheath having proximal and distal ends;

b) a flexible shaft extending through and axially movable relative to the sheath, said shaft having proximal and distal ends;

c) an end effector coupled to or formed at said distal end of said shaft, said end effector capable of being positioned in open and closed positions; and

d) a handle including coupling means for coupling said handle to the endoscope handle, and further including,

i) first means for longitudinally moving said sheath relative said working channel of the endoscope,

ii) second means for longitudinally moving said shaft relative to said sheath such that said end effector is movable between open and closed positions determined by relative positions of said sheath and said shaft, and

iii) third means for axially rotating said shaft relative to said sheath.

22. A surgical instrument according to claim 21, wherein:

said end effector is a snare.

23. A surgical instrument according to claim 21, wherein:

said shaft is freely axially rotatable relative to said second means.

24. A surgical instrument according to claim 21, wherein:

said shaft includes a key portion provided with a non-circular cross section, and said third means includes means for engaging said key portion.

25. A surgical instrument according to claim 21, wherein:

said third means is located distal said second means, and said shaft comprises a first element extending from said end effector to a location proximal said third means, and a second element extending from said location to said second means, said first and second elements being freely axially rotatable relative to each other.

26. A surgical instrument according to claim 25, wherein:

said first and second elements are coupled by a swivel joint.

27. A surgical instrument according to claim 25, wherein

said first element of said shaft is camber-free.

28. A surgical instrument according to claim 21, wherein:

said shaft is freely axially rotatable relative to said third means.

29. A surgical instrument according to claim 28, wherein:

said shaft is camber-free.

30. A surgical instrument according to claim 21, further comprising:

e) means for providing a cautery current to said shaft.

31. A surgical instrument for insertion through an endoscope having a handle and a working channel, said surgical instrument comprising:

a) an elongate flexible tubular sheath having proximal and distal ends;

b) a flexible shaft extending through and axially movable relative to the sheath, said shaft having proximal and distal ends;

c) an end effector coupled to or formed at said distal end of said shaft;

d) a first means for rotating said shaft relative to said sheath;

e) a second means for longitudinally moving said shaft relative to said sheath; and

f) a means for fixedly coupling said surgical instrument relative to the handle of the endoscope.

32. A surgical instrument according to claim 31, wherein:  
said end effector is a snare.

33. A surgical instrument according to claim 31, wherein:  
said means for fixedly coupling includes a first portion couplable to the endoscope and a second portion coupled to said sheath and longitudinally adjustably fixable relative to said first portion, such that said sheath may be longitudinally adjusted relative to the working channel.

34. A surgical instrument according to claim 31, wherein:  
said shaft is freely axially rotatable relative to said second means.

35. A surgical instrument according to claim 31, wherein:  
said shaft includes a key portion provided with a non-circular cross section, and said first means includes means for engaging said key portion.

36. A surgical instrument according to claim 31, wherein:

said first means is located distal said second means, and said shaft comprises a first element extending from said end effector to a location proximal said first means, and a second element extending from said location to said second means, said first and second elements being freely axially rotatable relative to each other.

37. A surgical instrument according to claim 36, wherein:

said first and second elements are coupled by a swivel joint.

38. A surgical instrument according to claim 36, wherein

said first element of said shaft is camber-free.

39. A surgical instrument according to claim 31, wherein:

said shaft is freely axially rotatable relative to said second means.

40. A surgical instrument according to claim 39, wherein:

said shaft is camber-free.

41. A surgical instrument according to claim 31, further comprising:

e) means for providing a cautery current to said shaft.

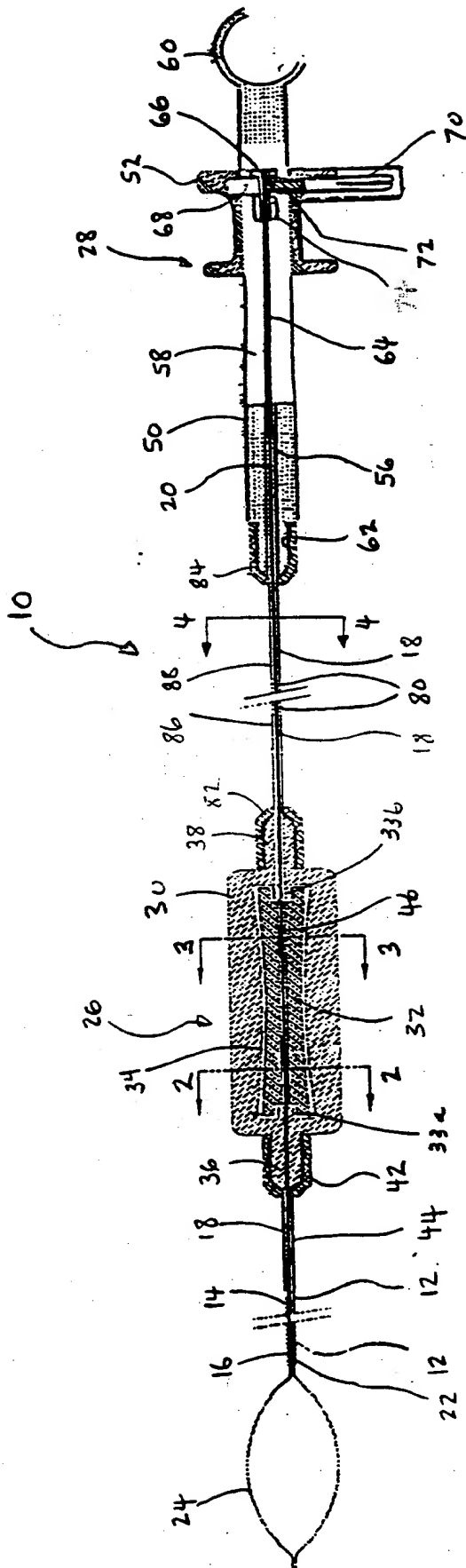


FIG. 1

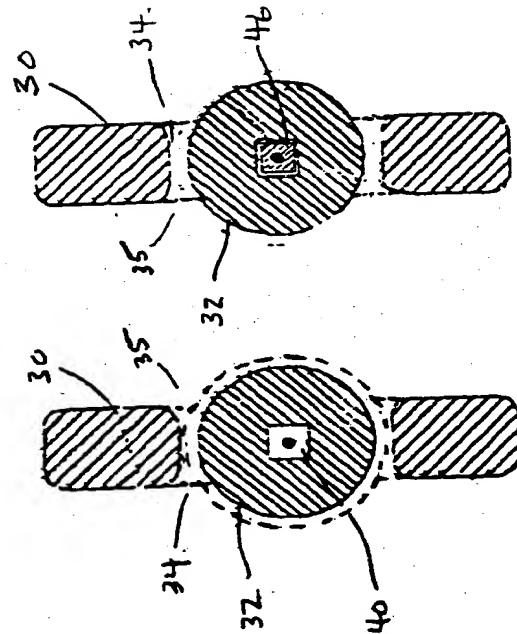


FIG. 2

FIG. 3

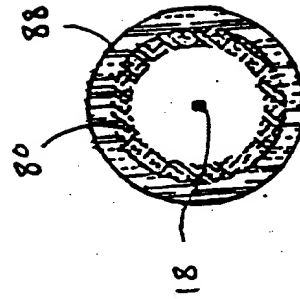


FIG. 4



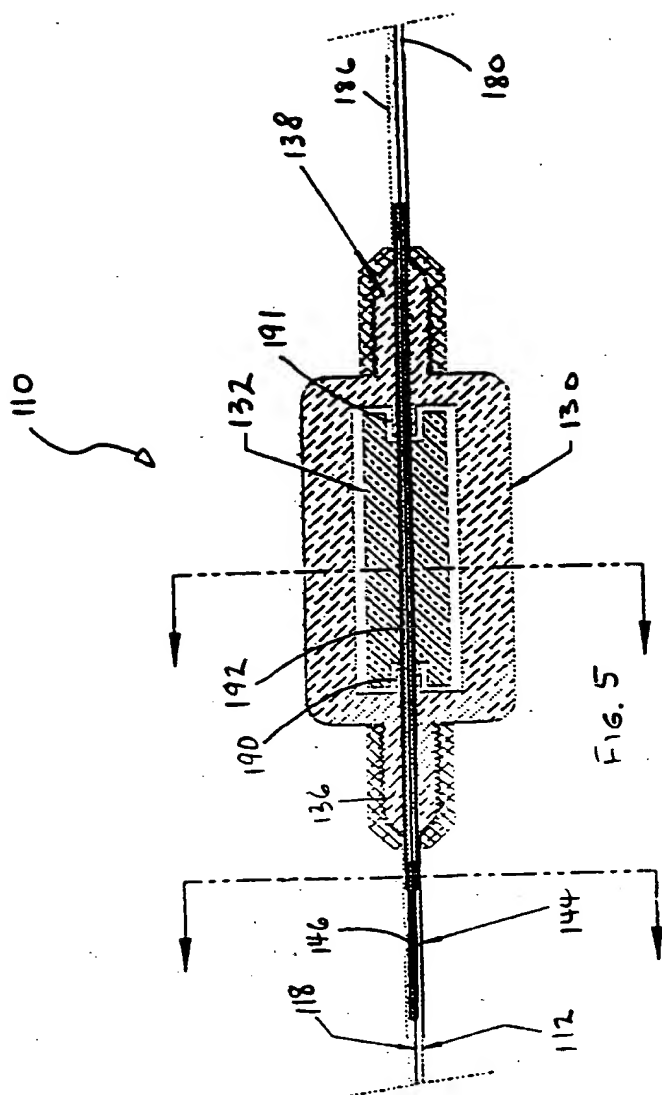


FIG. 5

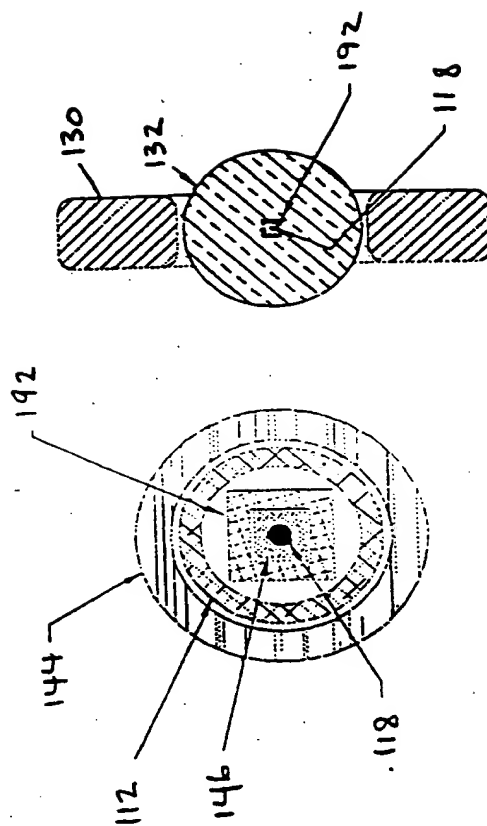


FIG. 6

FIG. 7

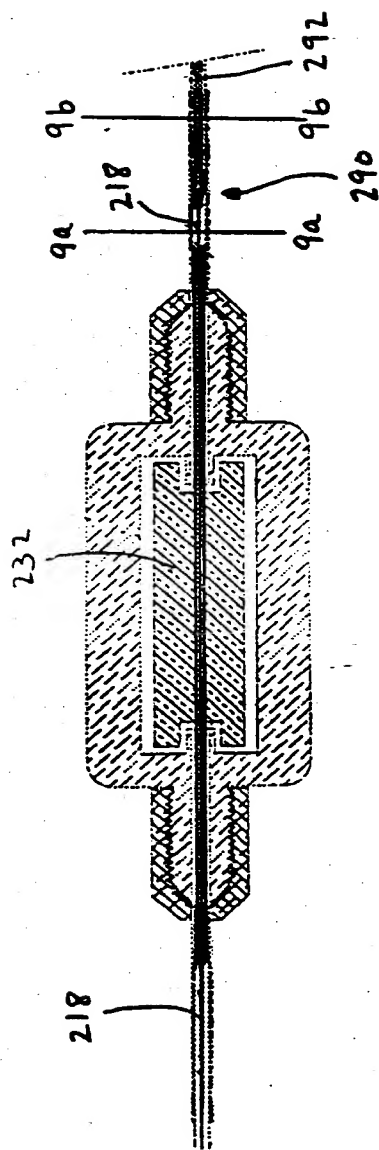


FIG. 8

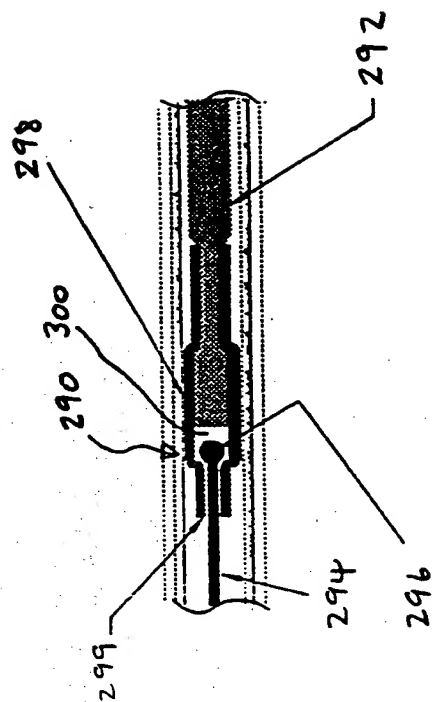


FIG. 9

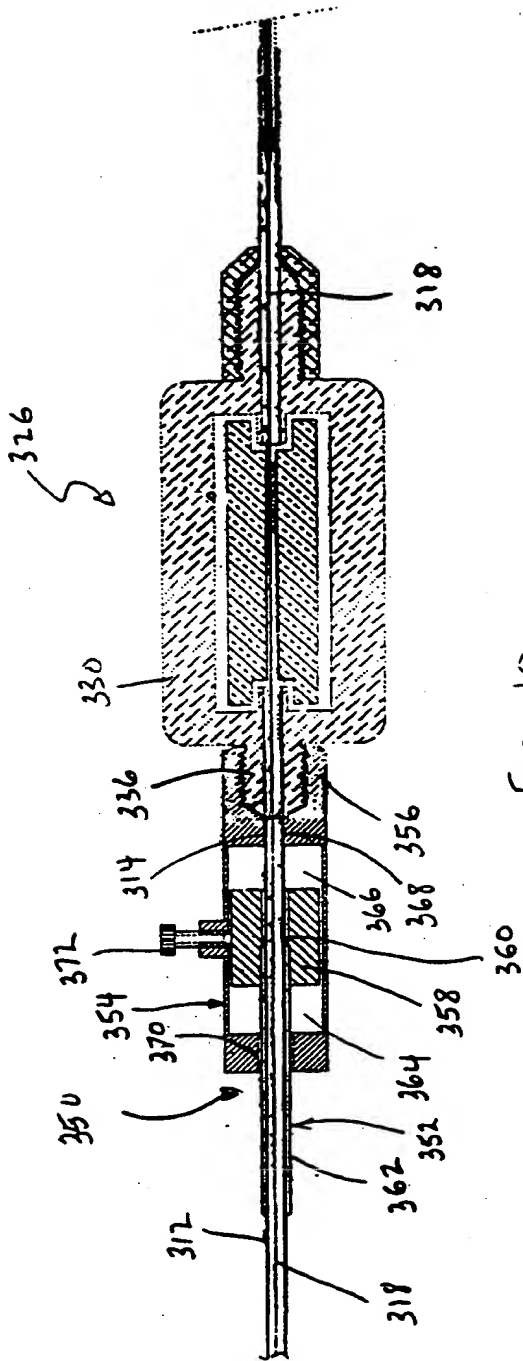


FIG. 10

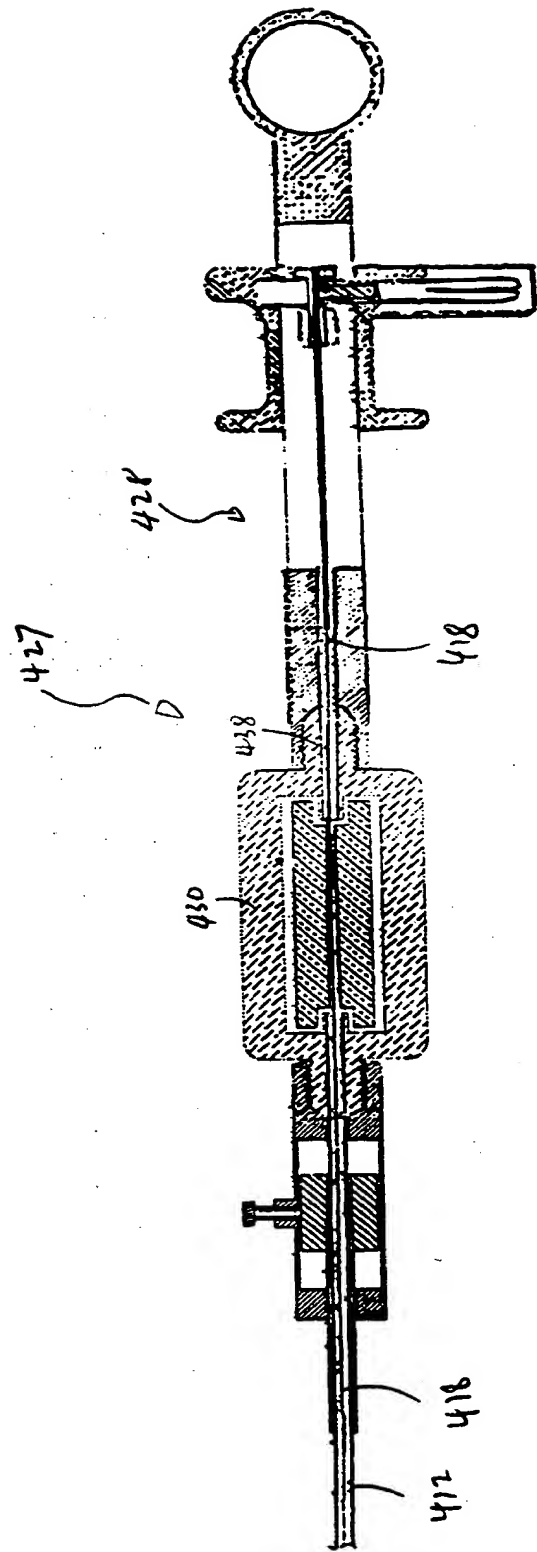


FIG. 11

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/21411

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : A61B 18/18

US CL : 606/47

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 606/41, 45-52, 110-113

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 3,955,578 A (CHAMNESS et al.) 11 May 1976, see entire document.	1-4, 14, 15 and 18 ----- 19-23, 28-32, 34, 39-41
Y	US 5,759,187 A (NAKAO et al.) 02 June 1998, see figures.	19-23, 28-32, 34, 39-41

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

06 OCTOBER 2000

Date of mailing of the international search report

24 OCT 2000

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

MICHAEL PEEFFLEY

Telephone No. (703) 308-0858